

R E M A R K S

I. Introduction

For the reasons set forth below, it is respectfully submitted that the pending claims are not unpatentable over the cited prior art references. The specification has been amended to address the inadvertent grammatical errors identified by the Examiner. Applicant notes his appreciation for the Examiner's assistance in correcting the specification.

It is noted that claim 10 has not been specifically addressed in the pending Office Action. As such, it is unclear if the Examiner intended to indicate claim 10 as allowable, or reject claim 10 along the lines of one of the rejections set forth in the Office Action. Clarification is respectfully requested.

Applicant respectfully requests that the pending rejections be reconsidered in view of the following remarks.

II. The Rejection Of Claims 1, 2, 4 And 11 Under 35 U.S.C. § 102

Claims 1, 2, 4 and 11 were rejected under 35 U.S.C. § 102 as being anticipated by USP No. 6,563,564 to Mol. Applicant respectfully submits that the claims are patentable for at least the following reasons.

As recited by claim 1, the present invention relates to a method for compensating for lens aberration by optimizing the source illumination profile (i.e., the shape of the source illumination). In other words, the present invention relates to a method for determining the optimal shape of the illuminator to be utilized in the imaging process. The method entails: (1) defining a cost metric that quantifies the effect of the shape of the source illumination on the imaging performance given a specific aberration field in the pupil plane of the imaging system,

and (2) modifying the source illumination profile until the cost metric is minimized. The source illumination profile having the minimum value represents the optimum illuminator shape for the given aberration field. It is noted that claim 1 expressly recites the steps of modifying the source illumination profile and recalculating the cost metric and repeating this process until the cost metric is minimized.

Turning to Mol, the reference relates to a method for compensating for the effects of aberration as the aberrations change over time due, for example, to the effects of heat during the use of the apparatus and illumination system. As set forth in the specification of Mol, equations are generated which represent the effects of heat from the illumination source on system performance over time. Specifically, Mol discloses defining an equation which indicates the focus drift caused by lens heating (*see*, Mol, Equation (1)). The variables in this equation are time and two scaling factors, A_1 and A_2 . The scaling factors represent the lens heating sensitivity at a given illumination setting, reticle structure and field shape utilized for the exposure (*see*, Mol, paragraph [0071]). The calibration procedures disclosed by Mol are intended to determine these scaling factors, because once determined, the equation can be utilized to determine how to adjust the reticle or illuminator during the operation of the system over time. Mol also states that this information (i.e., the results of the equation) can be stored in a database and recalled as necessary during use. In addition, it is also possible to include additional information for other illumination settings of interest (*see*, Mol, paragraph [0079]).

Importantly, however, at a minimum, Mol does not disclose or suggest: (1) defining a cost metric that quantifies the effect of the shape of the source illumination on the imaging performance given a specific aberration field in the pupil plane of the imaging system, or (2) modifying the source illumination profile until the cost metric is minimized. As is clear from the

foregoing, Mol does not suggest adjusting the shape of the illuminator when attempting to minimize the cost metric. Indeed, Mol does not disclose minimizing any metric. Mol discloses computing the scaling factors for each illumination setting of interest, and then including the results of the computation as part of the overall database. There is no minimization of a cost metric, much less one that is minimized by adjusting the shape of the illuminator disclosed by Mol.

Referring to the paragraphs of Mol suggested in the Office Action as disclosing the foregoing aspects of the claimed invention, paragraph [0067] of Mol states that the adjustments set forth, for example, in Table 1, are the end result of the calibration process. However, as noted, there is no reiterative process of adjusting the illuminator shape until the cost metric is minimized disclosed in Mol. Paragraphs [0077] and [0078] simply disclose selecting other illumination settings to obtain scaling factors at these additional settings as described above (referred to as fine calibration). Once again, there is no reiterative process of adjusting the illuminator shape until the cost metric is minimized. Paragraphs [0084]-[0088] of Mol also fail to disclose the foregoing steps, as these paragraphs appear to simply state that a form of interpolation can be utilized to determine the system adjustments if it is desirable to make an adjustment at a time not specifically disclosed in the calibration database.

Thus, as anticipation under 35 U.S.C. § 102 requires that each element of the claim in issue be found, either expressly described or under principles of inherency, in a single prior art reference, *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 USPQ 781 (Fed. Cir. 1983), and at a minimum, Mol does not disclose the claim elements noted above, it is clear that Mol does not anticipate claim 1, or any claim dependent thereon.

III. The Rejection Of Claims 3, 5-9 And 12 Under 35 U.S.C. § 103

Claims 3, 5-9 and 12 were rejected under 35 U.S.C. § 103 as being obvious over Mol in view of USP Pub. No. 2002/0195538 to Dowsk. Applicant respectfully submits that the claims are patentable over Mol and Dowsk, taken alone or in combination with one another, for at least the following reasons.

Of the rejected claims, claims 5 and 8 are independent claims. Both of these claims recite the steps of: (1) defining a cost metric that quantifies the effect of the shape of the source illumination on the imaging performance given a specific aberration field in the pupil plane of the imaging system, (2) modifying the source illumination profile until the cost metric is minimized, and (3) utilizing the source illumination profile corresponding to the minimized cost metric as the illumination source for illuminating the reticle.

As noted above, Mol fails to disclose the first two of the foregoing elements of claims 5 and 8. The third element above further clarifies the differences between Mol and the present invention. As recited by the third element, the source illumination profile corresponding to the minimized cost metric defines the shape of the illuminator (defines the diffractive optical element as recited by claim 8) utilized to illuminate the reticle. In Mol, the calibration process and adjustments are determined for a given illumination, and any adjustment, if necessary, is performed over time after the illuminator has been in use. Mol does not disclose any process to define the optimal shape of the illuminator which should be utilized to illuminate the reticle. Dowsk is neither relied upon, nor does it disclose the foregoing elements of claims 5 and 8. As such, Dowsk does not cure the deficiencies of Mol.

Thus, as each and every limitation must be disclosed or suggested in order to establish a *prima facie* case of obviousness (*see*, M.P.E.P. § 2143.03), and the combination of Mol and

Dowsk fail to do so for at least the foregoing reasons, it is respectfully submitted that claims 5 and 8 are patentable over the cited prior art references.

IV. All Dependent Claims Are Allowable Because The Independent Claim From Which They Depend Is Allowable

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claims 1, 5 and 8 are patentable for the reasons set forth above, it is respectfully submitted that all pending dependent claims are also in condition for allowance.

V. Request For Notice Of Allowance

Having fully responded to all matters raised in the Office Action, Applicants submit that all claims are in condition for allowance, an indication for which is respectfully solicited.

If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below.

To the extent necessary, Applicants petition for an extension of time under 37 C.F.R. 1.136. Please charge any shortage in fees due in connection with the filing of this paper,

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including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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